SCAO Administrative Memorandum 2000-05
May 9, 2000

Standards for Digital Audio Recording Systems

Michigan State Court Administrative Office

Scope of These Standards

These standards are developed pursuant to the State Court Administrator's responsibility for approving courtroom recording equipment. (See MCR 8.103, MCL 600.8611, and MCL 600.859.) Digital audio recording systems must meet these standards to be used in Michigan trial courts. In addition to establishing minimum qualifications, this document is also intended as a guide to courts which may be considering these systems.

As this technology changes, so too will the industry standards for compression, storage, and functionality. These standards will require periodic review and updating. As such, this document should be viewed as a living document which will evolve with the systems it describes.

Acknowledgments

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Description of Digital Audio Recording Systems

Digital audio systems generally incorporate three types of components:

Dedicated hardware - workstations, servers, disk and tape drives, etc. that are dedicated to the system;

Proprietary hardware - sound processing equipment (sound cards, mixers, voice processors) and tape duplication equipment (especially high-speed duplicators) are often developed by the vendor and often cannot be replaced with off-the-shelf components;

Proprietary software - the software used to operate the system will have many proprietary components, but may also accomplish some of its functions through generally-available utilities and programs. The customer may be able to select certain components, based on which functions of the system are desired.

System Design

Systems vary widely in their designs. Some operate on a standalone PC, while others take advantage of the benefits of network technology. Courts should consider the benefits of each approach, as well as the vulnerabilities and costs of each design.

To guarantee that courts will be able to choose from many potential system vendors, and to ensure that systems are able to grow and take advantage of new technologies, all systems must adopt an open architecture design. This approach enables different vendors to supply different parts of the overall system. As such, device interfaces must conform to industry standards.

Required:

Open architecture

A system must utilize an open architecture approach, utilizing devices with standard interfaces.

Compatibility with peripherals

A system must support standard peripheral devices used in transcription, such as foot pedals and headphones, using industry standard interfaces.

Audio Recording

The core function of digital audio recording systems is to convert the audio signal from the various microphones into a digital format and store it as a computer file. Many systems allow multi-channel recording (as many as 4), which allows individual speakers to be isolated on playback. This improves the chances that an accurate transcript will be made when two or more people are speaking at the same time.

Required:

Audio recording

A system must record the court's proceedings and store the recording in a digital format with a continuous time stamp.

Optional:

Record playback

Some systems are capable of playing back a portion of the recording while continuing to record.

Storage

Digital audio recording systems create a computer file, usually on the computer's hard drive. However, the permanent (archive) file is created by copying the file on the hard drive to some other, often external, medium. This may be done manually, or automatically by the system. These media fall into two categories: magnetic and optical. Examples of magnetic storage media are floppy disks, DAT tapes, and JAZ drives. Optical media include compact disks and DVD's. Some optical media can be written to only once, but read many times (WORM), while others can be rewritten (RW). Magnetic media, by their nature, can be rewritten.

Required:

Recording format

A system must store the converted audio signal in an open, publicly available (non-proprietary) digital format. Examples include WAV and MPEG II. Lossy compression algorithms (in which the decompressed file does not contain all the information present in the original file) are permitted if they do not detract from the playback quality of the file or inhibit the creation of a complete, true, and correct transcript.

Long-term backup

A system must create a backup of the audio files (and annotations database if applicable) for disaster recovery.

Long-term storage medium

A system must archive the permanent copy of the digital recording on a widely-available, industry-accepted medium which can be stored separately from the system. Both magnetic and optical media are allowed, but optical media are strongly encouraged due to their durability, widespread acceptance by the industry, and ability to be configured to write only once to a given disk.

Optional:

Find and restore

Some systems provide a means of tracking and locating material that has been moved to long-term storage. (See "Organization" in the Appendix.)

Playback and Transcription

After recording and storage, the digital audio files will need to be transferred to the transcriptionist. In many cases, only part of a day's proceedings will need to be transferred.

Systems must be able to replay a recording so that the court can create a transcript of the proceedings. Most systems provide a separate software utility designed to play back the recording.

Required:

Non-proprietary transfer medium

Any medium used to transfer the digital recordings to transcriptionists must be a widely-available, industry-accepted medium (e.g., CD, JAZ, DAT, etc.) so they can replay the recording on readily-available equipment.

Access

A system must be able to access a digital recording using rewind, fast forward, search by timestamp, and other direct access methods to enable a system operator to quickly find passages of interest.

Playback quality

A system must play the recording back at a sufficient quality level to enable the preparation of a complete, true, and correct transcript. Playback quality will be determined by the customer.

Voice isolation

A system must be able to isolate the voices of speakers who speak simultaneously.

Separate volume controls

A system must provide separate volume controls for each channel.

Optional:

Selection of material

A system may have the ability to identify recorded material that needs to be sent to the transcriptionist, or the user may develop a process to extract this information. (See "Organization" in the Appendix.)

Peripherals

Some vendors may supply transcriptionists with the peripheral devices (e.g., CD-ROM drive, foot pedal, etc.) necessary to produce the transcript.

Annotations

Many systems include an integrated note-taking utility, which allows the system operator to take notes that are tied to time stamps marking particular sections of the audio recording.

Although an integrated note-taking utility can enhance the efficiency of a digital audio recording system, it is not central to its functioning and is therefore not required. However, if a system includes such a utility, it must permit the editing of the notes after they have been taken.

Required:

Editing annotations

An integrated note-taking utility must allow notes to be changed after they have been made, either through system functionality or by exporting, editing in a different program, then re-importing to the system.

Optional:

Session setup

The system may provide utilities useful in preparing to record a session, such as entering the date and time, courtroom, judge, case number, etc. for the case about to be recorded.

Customization

This is the ability to make configuration choices that will affect the use of the system by all users, as well as to make changes to the interface that are specific to each session.

Multiple annotators

Some systems provide a utility that allows users other than the court recorder to take notes and link them by time stamp to the audio.

Search annotations

This is the ability to search through the annotations to find specific material to play back.

Highlight current tag

Some systems highlight the annotations corresponding to the audio as it is played back.

Reliability and Security

Because court recording is "mission critical", equipment used in performing this function must be reliable. Systems need to provide operators with various forms of information that indicate that the system is functioning properly.

Because digital audio recording systems are PC-based, security becomes an issue. Courts should rely on their existing computer security policies and apply them to digital audio recording systems.

Required:

"Live" channel indicators

A system must continuously monitor all microphones and provide at least visual indication that each is picking up a signal. An audio alarm, in addition to a visual indicator, is desirable.

Confidence monitoring

A system must continuously monitor the storage medium and provide at least visual indication to the operator that the signal is being recorded.

Redundancy

To ensure that the recording is captured in the event of failure of a storage device, a system must store the signal to two separate storage devices simultaneously. One may be used as the emergency backup.

Audio "pause" indicator

A system must periodically produce an audible alarm when the system has been put in "pause" or "mute" mode, such as during a bench conference, to alert the operator to resume normal operation when the conference has ended.

Optional:

Security and privileges

The system may be configured to allow different levels of access to different users.

Identify edited files

The system may allow the user to determine whether audio or text files (if the system contains a note-taking utility) have been edited or otherwise changed since they were created. The system may also be able to indicate whether copies of files are identical to original files created by the system.

Integration

The ability of a system to be integrated with other PC-based utilities will protect courts in the event that the system becomes unusable, obsolete, or no longer supported by the vendor. The degree of integration also presents opportunities to use a digital audio recording system more effectively by incorporating audio recordings from depositions, other hearings, etc.

Required:

Accessibility of data by non-system utilities

Because the storage format must be non-proprietary, it follows that the files must be able to be read by non-system software utilities.

Optional:

Importing sound recordings from an external source

This is the ability of a system to integrate non-system audio recordings into the digital audio system. This accommodates audio testimony or audio records created using a different system.

Importing case data

Some systems may allow the user to import case information (case name, number, parties, etc.) into the recording system, avoiding the need for manual entry of the information.

Analog Duplication

Digital technology represents great improvements over traditional analog recording equipment. For the foreseeable future, however, there will be a need to convert the digital recording to an analog recording and transfer it to audio cassettes for those who wish to have a copy of the recording but do not have access to the necessary digital equipment. Thus, digital systems must be "backward compatible" with cassette-based systems, primarily as a backup measure should the court find it necessary.

Required:

Produce tape

A system must be able to convert the digital recording to an analog recording and transfer it to a standard cassette tape.

Administration

Digital audio recording systems often provide a number of tools that make using the system easier.

Optional:

User setup

A system may include utilities to allow users to identify themselves on the system (e.g., user names and passwords).

Management reports

A system may provide utilities that generate basic reports on the status and contents of the system files (and annotations database if applicable), which is useful in identifying frequency and patterns of use, needs for training, and storage capacity planning.

Appendix: Factors to be considered by a prospective purchaser

Organization

How will the files created by the system be stored: by case? by day?
How will the court track the location of files?
How will files be named?
How does the digital audio system support these operational processes?

User interface

How intuitive and accessible is the system's interface?
How much training will be required to use the system?

Sufficient field length

Does the system allow sufficient space in the data fields to store the necessary information?

On-line capacity

How much data can be stored on the system's local drive? How many cases/days does this represent?

Off-line storage

What storage medium options are available for backing up the local data?
How efficient is the storage medium (how much data can you store on a given disk, tape, etc.)?

Duplication speed

How long does the system's tape duplicator take to transfer a given file to an analog tape?

Maintenance functions

Can users perform tasks necessary to maintain the system (defining network settings and disk structures, correcting interfaces, rebuilding databases, etc.), or must the vendor perform them?

Vendor Support

Will the vendor provide a free analysis of the components needed to provide the level of functionality the court desires, prior to the sale?
Will the vendor install the system, including network interfaces, and test it?
Will the vendor train court staff on the operation and maintenance of the system?
What type of support will the vendor provide after installation?
Does the purchase or maintenance agreement include any future upgrades?

Approved, SCAO

DIGITAL AUDIO RECORDING SYSTEM STANDARDS CHECKLIST

The State Court Administrative Office (SCAO) has established the Digital Audio Recording System Standards, which govern systems used in Michigan's trial courts. This checklist is intended as a tool for courts and vendors to use in assessing a digital audio recording system's compliance with the standards.

To obtain approval for a digital audio recording system, complete and mail this checklist to: **Digital Recording Coordinator, State Court Administrative Office, PO Box 30048, Lansing, Michigan 48909**. Courts are encouraged to work with their vendors in completing this checklist. The SCAO's approval will be granted based on its review of this document and any other relevant information.

Court Information

Court	Contact person	Telephone no.	Date

System Information

Vendor	Vendor Contact	Telephone no.
Manufacturer	System name	Version
Hardware components:		
Software components:		

System Design

Does the design utilize an open architecture approach, supporting internal and external devices using standard interfaces? ○ Yes ○ No

Does the system allow the user to use a foot pedal and headphones with standard interfaces when preparing a transcript? ○ Yes ○ No

Audio Recording

Does the system record the court's proceedings and store the recording in a digital format with a continuous time stamp? ○ Yes ○ No

File Format

Does the system store the converted audio signal in an open, publicly available (non-proprietary) digital format? ○ Yes ○ No

What format does the system store audio files in (e.g. WAV, MPG, etc.)? _____

Long-Term Backup and Storage Medium

Does the system create a backup of audio files for disaster recovery? ○ Yes ○ No

Does the system archive the permanent copy of the digital record on a widely available, industry accepted medium which can be stored separately from the system? ○ Yes ○ No

What storage medium is used to store the archive copy (e.g. CD, JAZ, DVD, etc.)? _____

Glossary of Technical Terms
Used with Digital Audio Recording Systems

This document explains many of the technical terms used in the Standards for Digital Audio Recording Systems. SCAO provides this glossary as a courtesy to assist court staff with certain technical terms; it contains information originally published by The Computer Language Co., Inc. The products and examples included in this glossary are meant to be illustrative of the types of technology courts may encounter in evaluating digital audio recording systems; inclusion in this document does not imply endorsement by SCAO.

The information below, and explanations of other technical terms, can be found at http://www.techweb.com/encyclopedia/.

Magnetic Disks

From Computer Desktop Encyclopedia
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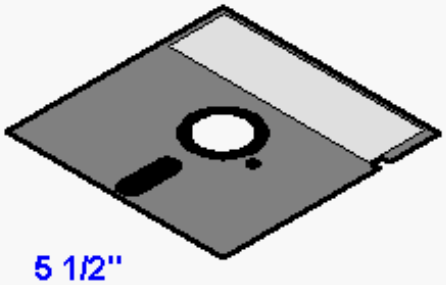
Floppy Disk

3 1/2"



5 1/2"

The most common removable storage medium is the floppy disk. In the mid 1990s, the 5.25" format gave given way to the 3.5" disk, but its 1.44MB capacity is woefully undersized for today's multimedia files and applications.

From Computer Desktop Encyclopedia
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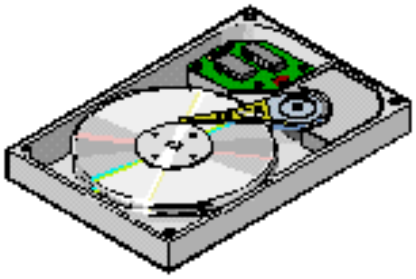
Zip Removable Disk

Iomega's Zip disk holds 100MB and was the first, low-cost removable disk to become popular across a broad market segment since the advent of the floppy.

Jaz Removable Disk

Iomega's removable Jaz disks come in 1GB and 2GB versions. The 1GB cartridges were introduced in 1995 at a breakthrough $99.

Fixed Hard Disk



The fixed hard disk, also known as Winchester technology, continues to be the mainstay storage for all types of computers from micro to mainframe.

For personal computers, hard disk capacities have soared with prices under 10 cents per megabyte in 1998. Hard disks will remain the primary storage medium for a number of years, but will be eventually eclipsed by optical disks and other optical storage

From Computer Desktop Encyclopedia

SparQ Removable Disk

SyQuest's SparQ is an affordable 1GB removable hard disk that is aimed at the consumer market.

Magnetic Tapes

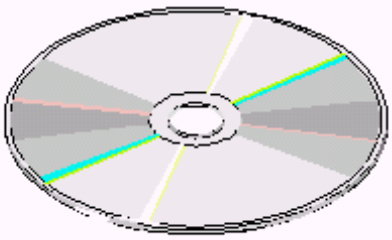
From Computer Desktop Encyclopedia

DAT 4mm Tape

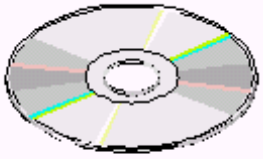
DAT tapes use the DDS recording standard and provide 2 to 12GB of storage. The cartridges look like small audio cassettes, and users love the compact format.

Optical Disks

CD-ROM, CD-R, CD-RW



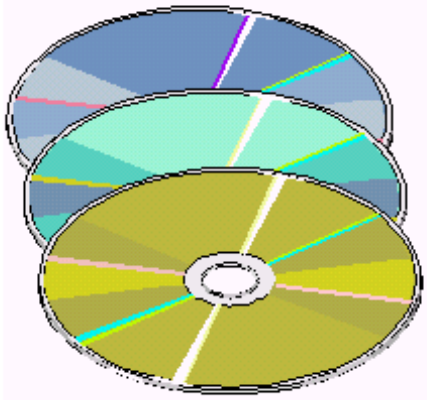
CD-ROM



Mini CD-ROM

The 120mm CD-ROM is the de facto standard for software distribution and for publishing large databases. The smaller mini CD-ROM is only 80mm in diameter and holds 180MB (compared to the full-size 650MB). It fits into the deeper well in the center of the tray in most CD-ROM drives.

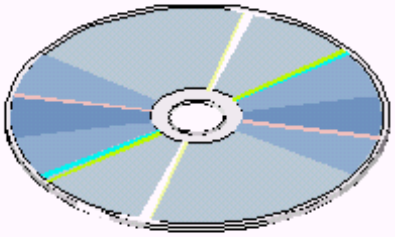
CD-ROMs have a silver cast just like audio CDs.



CD-R

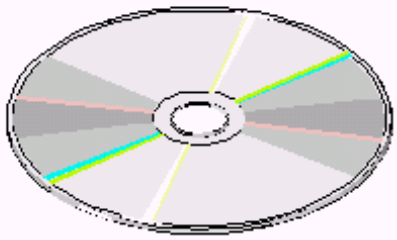
Blank CD-R discs can be recorded once and read on any CD-ROM reader. CD-Rs have a gold, blue or green cast.

CD-RWs can be rewritten, but must be read on newer MultiRead CD and DVD drives. CD-RWs have a blue cast.



CD-RW

DVD

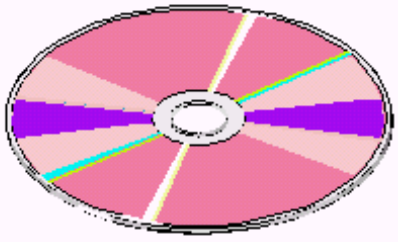


DVD-Video

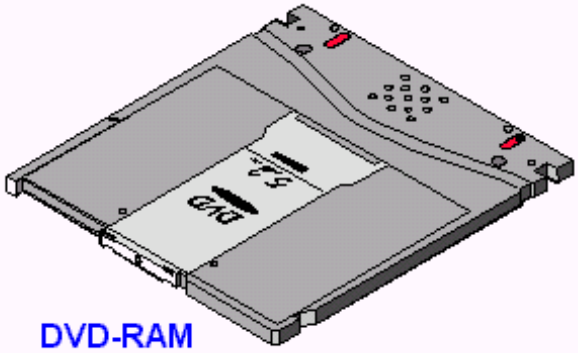
DVD-ROM

DVDs look like CDs, but hold from 4 to 28 times as much data. There is a DVD counterpart for every CD type.

DVD-Videos as well as DVD- ROMs are silver, read only discs. DVD-Rs are write once and have a pink cast. Rewritable DVD-RAMs can be double sided, so a cartridge is used to protect the surfaces and provide a label area.



DVD-R



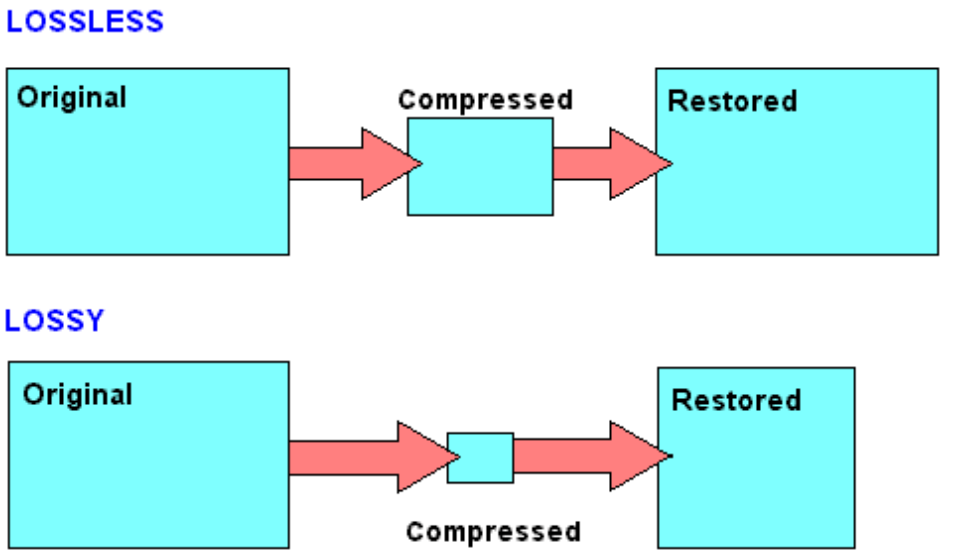
DVD-RAM

Lossy Compression

A compression technique that does not decompress data 100% back to original. Lossy compression provides high degrees of compression and results in very small compressed files, but there is a certain amount of loss when they are restored.

Audio, video and some imaging applications can tolerate some loss, and in many cases, it may not be very noticeable to the human eye. In other cases, it may be noticeable, but it is not that critical to the application. The more tolerance for loss, the smaller the file can be compressed.

Lossy compression is never used for business data and text, which demand a perfect restoration, or lossless compression.



Playback and Transcription

Is the medium which is used to transfer the digital recordings to transcriptionists a widely available, industry accepted medium? ○ Yes ○ No

Which medium will be used to transfer the digital recordings to transcriptionists? _____

Does the system enable direct access to specific passages, or sections, of the recording? ○ Yes ○ No

What mechanisms are used to provide direct access (fast forward/rewind, search by timestamp, search using scroll bar, etc.)? _____

Does the system play back the recording at a sufficiently high quality to enable a transcriptionist to prepare a complete, true, and correct transcript? ○ Yes ○ No

Is the system able to isolate the voices of multiple speakers who speak simultaneously? ○ Yes ○ No

Does the system provide separate volume controls for each channel? ○ Yes ○ No

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Annotations

Does the system include an integrated note-taking utility? ○ Yes ○ No

If yes:

Does this note-taking utility allow notes to be changed after they have been made? ○ Yes ○ No

Does this utility provide editing functions? ○ Yes ○ No

Does this utility require the user to export the notes to a different program to perform editing and then to reimport them into the system? ○ Yes ○ No

Does this utility enable the user to enter information about the session (e.g. date and time, courtroom, judge, case name and number, etc.)? ○ Yes ○ No

Does the system create a backup of the annotations database for disaster recovery? ○ Yes ○ No

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Reliability and Security

Does the system continuously monitor all microphones and provide at least visual indication that each is picking up a signal? ○ Yes ○ No

Does the system continuously monitor the storage medium and provide at least visual indication to the operator that the signal is being recorded? ○ Yes ○ No

Does the system store the signal to two separate storage devices simultaneously? ○ Yes ○ No

Does the system periodically produce an audible alarm when the system has been put in "pause" or "mute" mode, such as during a bench conference, to alert the operator to resume normal operation when the conference has ended? ○ Yes ○ No

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Integration

Are other non-system utilities (e.g. standard audio play back software) able to play back the recording created by the system? ○ Yes ○ No

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Analog Duplication

Is the system is able to convert the digital recording to an analog recording and transfer it to standard cassette tapes? ○ Yes ○ No